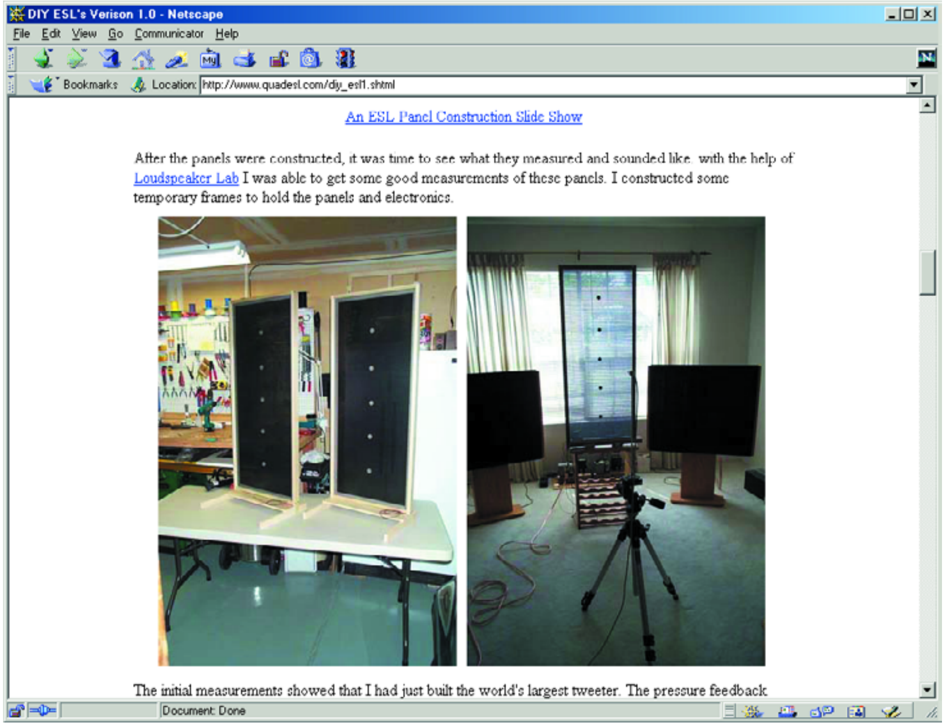
DIY Electrostatic Loudspeakers

High tension for sound reproduction

By Harry Baggen

Building your own loudspeaker boxes using traditional drive units was once a popular pastime but now seems to have lost much of its appeal. Those of you interested in a different approach to sound reproduction may want to have a go at building electrostatic loudspeakers. Amazing results can be obtained from basic materials that cost next to nothing. We trawled the net and found loads of information on these oddball boxes.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Bookmarks
Location: http://www.quadesl.com/diy_esl1.shtml
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An ESL Panel Construction Slide Show

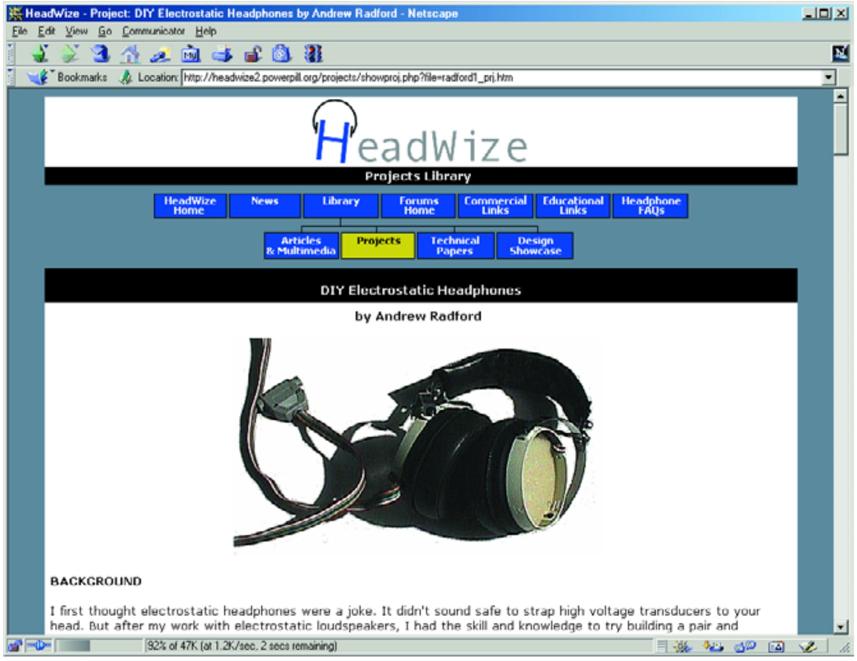
After the panels were constructed, it was time to see what they measured and sounded like. with the help of Loudspeaker Lab I was able to get some good measurements of these panels. I constructed some temporary frames to hold the panels and electronics.

The initial measurements showed that I had just built the world's largest tweeter. The pressure feedback

The operating principle of the electrostatic loudspeaker (or ESL) is based on the phenomenon of two electrical current conducting plates with opposite polarities developing a mutual attracting force, and two plates with the same polarity, a mutual repelling force. Most electrostatic loudspeaker units employ two air permeable panels (stators) separated by a taut conductive membrane. When a high alternating voltage is applied across the membrane and the stators, the panel will start to move between the stators in the rhythm of the ac voltage, causing a certain air volume to be displaced. The sound reproduction obtained in this way is (at least potentially) extremely faithful thanks to the small moving mass, the large surface area and the evenly distributed force.

By virtue of its relatively simple overall structure, the ESL is easy to experiment with. Lots of technically inclined music lovers have reached different results from perforated steel sheet, plastic foil and a number of variations on these materials. Some of the results have culminated in a fair number of Internet websites describing such experiments with electrostatic loudspeakers.

A foundation article telling you how to get started with ESLs is Mark Rehorst's story called **How to Make Electrostatic Loudspeakers** [1]. It has been around on the net for many (web-)years and may be



HeadWize - Project: DIY Electrostatic Headphones by Andrew Radford - Netscape

Location: http://headwize2.powerpill.org/projects/showproj.php?file=radford1_prj.htm

DIY Electrostatic Headphones

by Andrew Radford

BACKGROUND

I first thought electrostatic headphones were a joke. It didn't sound safe to strap high voltage transducers to your head. But after my work with electrostatic loudspeakers, I had the skill and knowledge to try building a pair and

92% of 47K (at 1.2K/sec, 2 secs remaining)

found at various sites. The article covers all basic elements that make up an ESL, from the building materials for the stators right up to the design of a high-tension supply. Anyone with some knowledge of electronics should be able to use this information and be off for a really quick start.

A more extensive and technically 'deeper' article is Neil McKean's **Electrostatic Loudspeaker Design** [2], covering both the design and the construction of electrostatic loudspeaker units.

Lots of ESL builders describe their designs on dedicated websites. There are far too many to list in this short article — only a small selection will be mentioned. The **Mini Mite** [3] by Sheldon Stokes is a small electrostatic panel combined with a Jordan driver in a transmission line enclosure. Another extremely well documented DIY project by the same author goes by the name of **DIY ESL 1.0** [4].

Matthew Anker's **Electrostatic Loudspeaker Page** [5] is also devoted to activities involving electrostatic speakers. In particular, the pages showing lots of constructional pictures are well worth having a look at.

An unusual ESL project covers the DIY construction of **electrostatic headphones** [6]. On his website dubbed 'Headwize' Andrew Radford (maybe a distant relative of the legendary Radford from the valve era?) explains how he changed an old pair of dynamic headphones into electrostatic ones! The story is supported by a number of clear drawings and photographs which go to show the amount of work that went into the design.

Not surprisingly, there are also suppliers of commercially made ESLs offering parts of their products for the benefit of home constructors. Completely assembled panels are particularly interesting as they allow less experienced constructors to build excellent sound reproduction systems. The Dutch manufacturers **AudioStatic** [7], for example, offer their DCI-LT as a construction kit consisting of two ready to use panels and built up high-tension units. All you need to do yourself is build a frame to hold the panels.

The Australian firm **Metaxas** [8] also offers an ESL set, called MET 1. Like the DCI-LT, MET 1 comprises a complete set of parts including a high-voltage section and audio transformers. The remarkable thing about this system is that several panels may be purchased for connecting in parallel.

If you just need an address to order suitable foil from (foil often being the only elusive material) you'll be pleased to know that there are several sources that can also supply other useful parts like graphite spray. **Twinstatic Audio** is a Dutch firm with a fair assortment of special components for ESL builders. Just a few clicks away but actually at the other side of the globe, in Australia, we found **The Electrostatic Loudspeaker Information Exchange** [10] and **ER Audio** [11].

Finally, the **Electrostatic Loudspeaker Circuit** [12] is a great source of inspiration for ESL lovers. The website has been on line since 1998 (!) and contains a large number of descriptions of commercial and home made ESLs. Here, too, we found extremely useful information on related matters like amplifiers for ESLs. Furthermore, there is a forum which allows hobbyists and fans of the electrostatic loudspeaker to exchange ideas and information.

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Internet addresses

[1] How to Make Electrostatic Loudspeakers:
www.amasci.com/esloud/eslhwto.html

[2] Electrostatic Loudspeaker Design:
www.audiodesignguide.com/esl/esl.html

[3] Mini Mite ESL: www.audiocircuit.com/9041-esl-circuit/Diy/Projects/SheldonStokes-SS/9041DESS-MM.htm

[4] DIY ESL 1.0:
www.quadesl.com/diy_esl1.shtml

[5] Electrostatic Loudspeaker Page:
http://home1.gte.net/res0f2t3/index.htm

[6] Electrostatic headphones:
http://headwize2.powerpill.org/projects/showproj.php?file=radford1_prj.htm

[7] AudioStatic-DIY kit:
www.audiostatic.com/page9.htm

[8] Metaxas MET 1:
www.metaxas.com/pages/masnewfiles/index.html

[9] Twinstatic Audio:
www.twinstaticaudio.nl/onderdelen/

[10] The Electrostatic Loudspeaker Information Exchange:
www.hitechnetworks.net/bwaldron/main.htm

[11] ER Audio: www.eraudio.com.au/

[12] The Electrostatic Loudspeaker Circuit:
www.audiocircuit.com/9041-esl-circuit/9041IMAI.htm